COMING UP FOR AIR: PERSPECTIVES FROM FIVE YEARS OF DO MONITORING IN ILLINOIS

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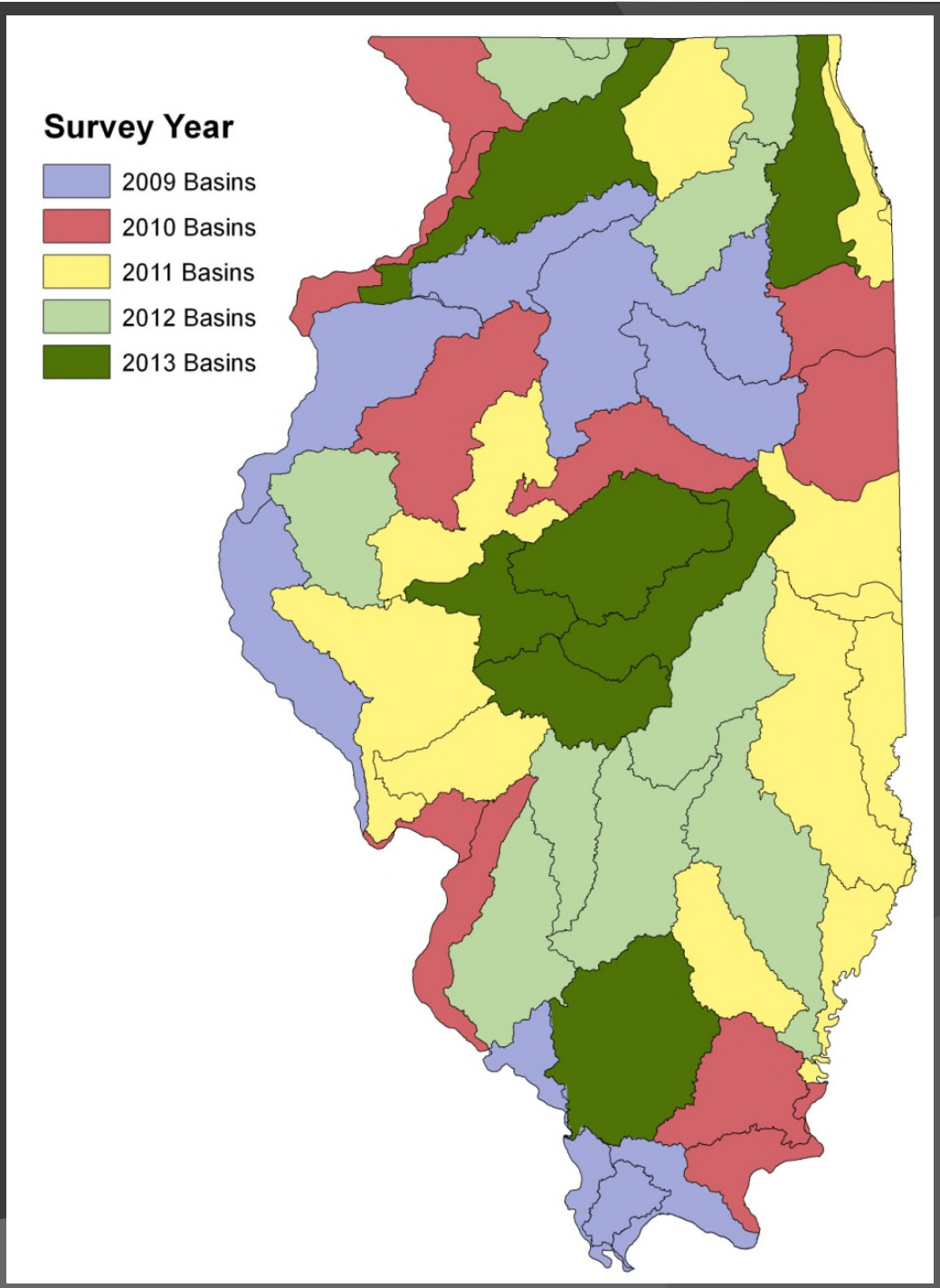
Project Goals and Objectives

- Beginning 2009 Intensive River Basin Survey (IRBS) monitoring program expanded to include continuous water quality monitoring
- IBS monitoring program is designed for wadable streams
- Continuous monitoring augmented with in situ sampling and measurements
- These data then used for assessment purposes and for eventual inclusion in STORET.

Basins to visit in 2014

- Vermilion (IL River)
- Upper IL River
- Green River
- Mississippi North Central
- Mississippi Central
- Mary's River
- Mississippi South
- Lower Cache River
- Upper Cache River



Monitoring/Sampling Strategy

- Monitoring sites are provided by IEPA and follow existing IRBS rotation
- Each site monitored for two seven day periods during summer low flows (June 1- July 31 and Aug 1- Oct 15)
- ISWS efforts follow IEPA Standard Operating Procedure for Continuous Monitoring of Water Quality
- Discharge measurements done when sondes are deployed and retrieved

Monitoring/Sampling Strategy

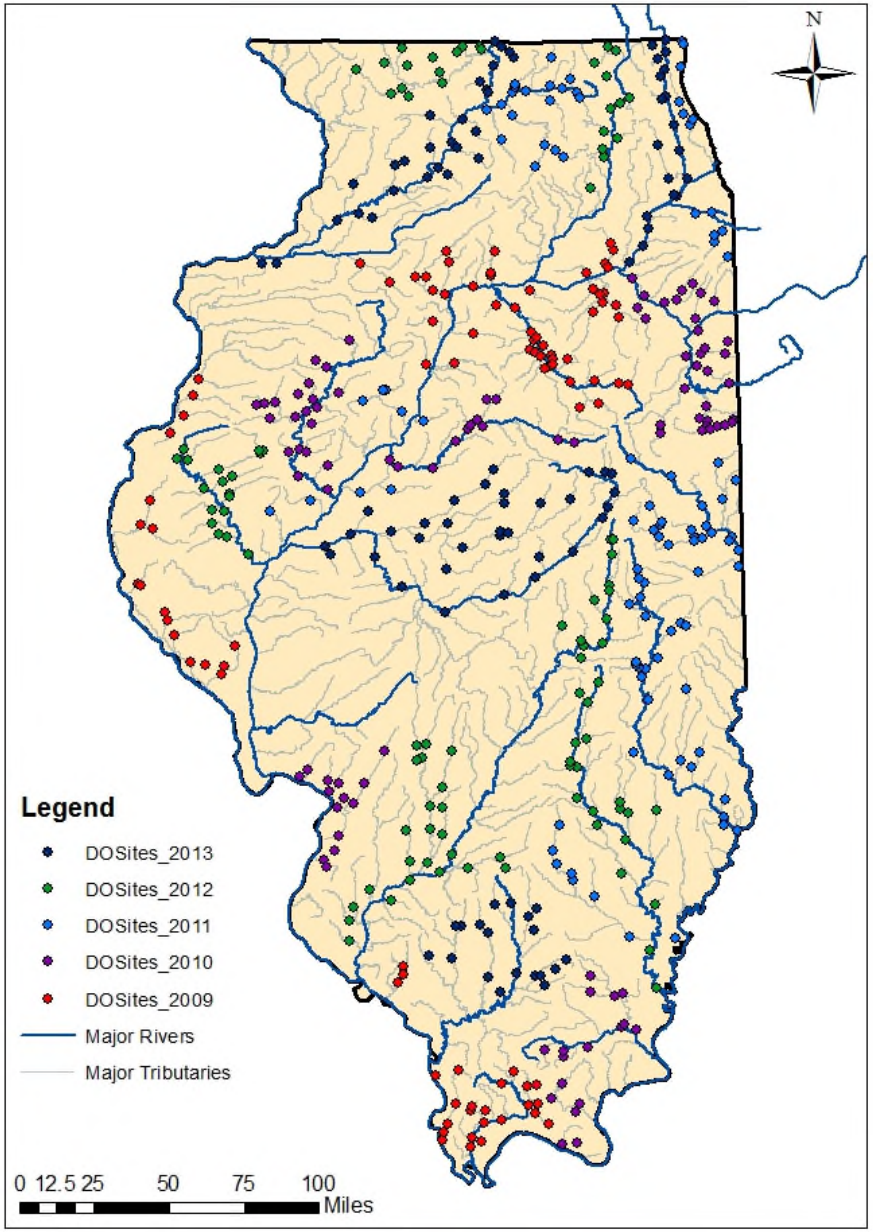
- Water sample collected at time of deployment. Sample is simple grab taken from center of stream.
- Collected samples are analyzed at IEPA contract laboratory for:
  - TSS
  - VSS
  - Total P
  - Nitrate + Nitrite (as N)
  - Ammonia (as N)
  - TKN

- Two 7-day deployments at each site
- 490 sites visited 2009-2013

  NMU – 166 sites

  CMU – 167 sites

  SMU – 157 sites
- 975 deployments
- Two 2-person crews making 4 installs/retrievals each day
- 3 summer staff hired each year



- Sondes calibrated on site of deployment
- Calibrations use known standards except DO which is done using a “water saturated air” calibration
- 15-minute time step for all parameters
- Sondes are placed inline with flow with probes facing downstream

Deployment Mounts

- Before retrieval a second freshly calibrated sonde, logging every minute, is placed on the frame and allowed to log for 30 minutes
- This record provides a simultaneous read and independent measure of in-situ conditions.
- Upon retrieval all fouling is gently washed off and a post-deployment calibration check is made for all parameters against known standards
- This procedure allows for partitioning total error into error due to sensor drift and that due to bio-fouling
- This information can be useful when qualifying the data such as when a runoff event is known to have occurred during the deployment

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	DateTime	Temp	Temp	pH	pH	SpCond	SpCd	ODO%	ODO	ODO Conc	ODO	Turbidity+	Turb	Battery	
2	M/D/Y	C	Qual		Qual	uS/cm	Qual	%	Qual	mg/L	Qual	NTU	Qual	V	E-19
769	7/31/2013 6:00	19.78		7.95		726.8		77.4		7.06		17.8		11.7	
770	7/31/2013 6:15	19.78		7.95		726.8		77.3		7.05		17.7		11.8	
771	7/31/2013 6:30	19.78		7.95		726.9		77.2		7.04		19.2		11.7	
772	7/31/2013 6:45	19.79		7.95		726.9		77.3		7.04		16.7		11.7	
773	7/31/2013 7:00	19.79		7.95		727.1		77.1		7.03		17.9		11.7	
774	7/31/2013 7:15	19.8		7.95		727.1		77.3		7.04		17		11.7	
775	7/31/2013 7:30	19.81		7.95		727.2		77.2		7.03		16.3		11.7	
776	7/31/2013 7:45	19.83		7.95		727.1		77.5		7.06		18		11.8	
777	7/31/2013 8:00	19.85		7.95		727.3		77.5		7.05		18.9		11.8	
778	7/31/2013 8:15	19.87		7.95		727.2		77.7		7.07		22.5		11.7	
779	7/31/2013 8:30	19.87		7.95		727.4		77.8		7.08		17.3		11.7	
780	7/31/2013 8:45	19.88		7.95		727.4		77.7		7.07		15.4		11.8	
781	STOP														
782	7/31/201 :00	19.91		7.97		138.8		86.2		7.85		11			
783															

7-day file

SR file

	A	B	C	D	E	F	G	H	I
1	DateTime	Temp	pH	SpCond	ODO%	ODO Conc	Turbidity+	Battery	
2	M/D/Y	C		uS/cm	%	mg/L	NTU	V	E-19
48	7/31/2013 8:40	19.89	7.91	754.9	78.2	7.11	14.1	10.9	
49	7/31/2013 8:41	19.9	7.91	754.8	78.2	7.11	13.5	10.9	
50	7/31/2013 8:42	19.89	7.92	755	78.1	7.1	14.3	10.9	
51	7/31/2013 8:43	19.9	7.91	754.9	78.1	7.1	14.2	10.8	
52	7/31/2013 8:44	19.9	7.92	754.8	78.1	7.1	13.4	10.9	
53	7/31/2013 8:45	19.89	7.92	755	78.1	7.11	15	10.9	
54	7/31/2013 8:46	19.9	7.92	754.9	78.1	7.1	13.9	10.9	
55	7/31/2013 8:47	19.9	7.92	755	78.1	7.1	13.4	10.8	
56	7/31/2013 8:48	19.9	7.92	755	78.1	7.1	13.9	10.9	
57	7/31/2013 8:49	19.9	7.92	755	78.1	7.1	14.2	10.9	
58	7/31/2013 8:50	19.9	7.92	755	78.1	7.1	14.1	10.9	
59	7/31/2013 8:51	19.9	7.92	754.9	78.1	7.1	13.6	10.9	
60	7/31/2013 8:52	19.9	7.93	755	78	7.09	13.4	10.9	
61	7/31/2013 8:53	19.9	7.93	755	78.1	7.1	13.8	10.8	
62	7/31/2013 8:54	19.9	7.93	755.1	78.1	7.1	13	10.9	
63	7/31/2013 8:55	19.9	7.93	755.1	78.1	7.1	13.4	10.9	
64	7/31/2013 8:56	19.9	7.93	755	78.1	7.1	12.9	10.9	
65	7/31/2013 8:57	19.9	7.93	755	78	7.09	13.5	10.9	
66	7/31/2013 8:58	19.9	7.93	755.1	78	7.09	13.8	10.9	
67	7/31/2013 8:59	19.9	7.94	755	78.1	7.1	13.7	10.9	
68	STOP								
69	7/31/2013 9:00	20.12	7.93	54.9	86.1	7.81	-1.8	10.8	
70	7/31/2013 9:01	19.93	7.95	26.9	83.8	7.63	24.9	10.7	
71	7/31/2013 9:02	20.3	8	10	97.4	8.8	-1.8	10.7	
72	7/31/2013 9:03	20.44	8.01	8.1	97.3	8.77	-1.5	10.7	
73	7/31/2013 9:04	20.41	7.93	14.5	95.3	8.6	-1.7	10.8	
74	7/31/2013 9:05	20.69	8.02	8.6	97.4	8.74	-1.6	10.9	
75	7/31/2013 9:06	20.85	8.05	7.7	97.4	8.71	-1.2	10.8	
76	7/31/2013 9:07	21.14	8.17	13.2	99	8.8	11.4	10.8	
77	7/31/2013 9:08	22.93	8.25	5.2	94	8.08	1290.2	10.9	
78									

- The time stamp generally determines which read to use for the “independent measurement of conditions immediately prior to retrieval”.

IEPA Qualifier criteria

- Any parameter with a relative percent difference (RPD) greater than 20% qualifies as failed
- Any parameter fails if the calibration drift is greater than the lesser of 2X the manufacturer stated accuracy or the values below

Criteria for Data Acceptability	
Parameter	Calibration Drift
pH	≤ 0.4 standard unit
SpC	≤ 3% of the reading
D.O.	≤ 2% Sat., ≤ 0.4 mg/L
Turb	≤ 4% of Standard

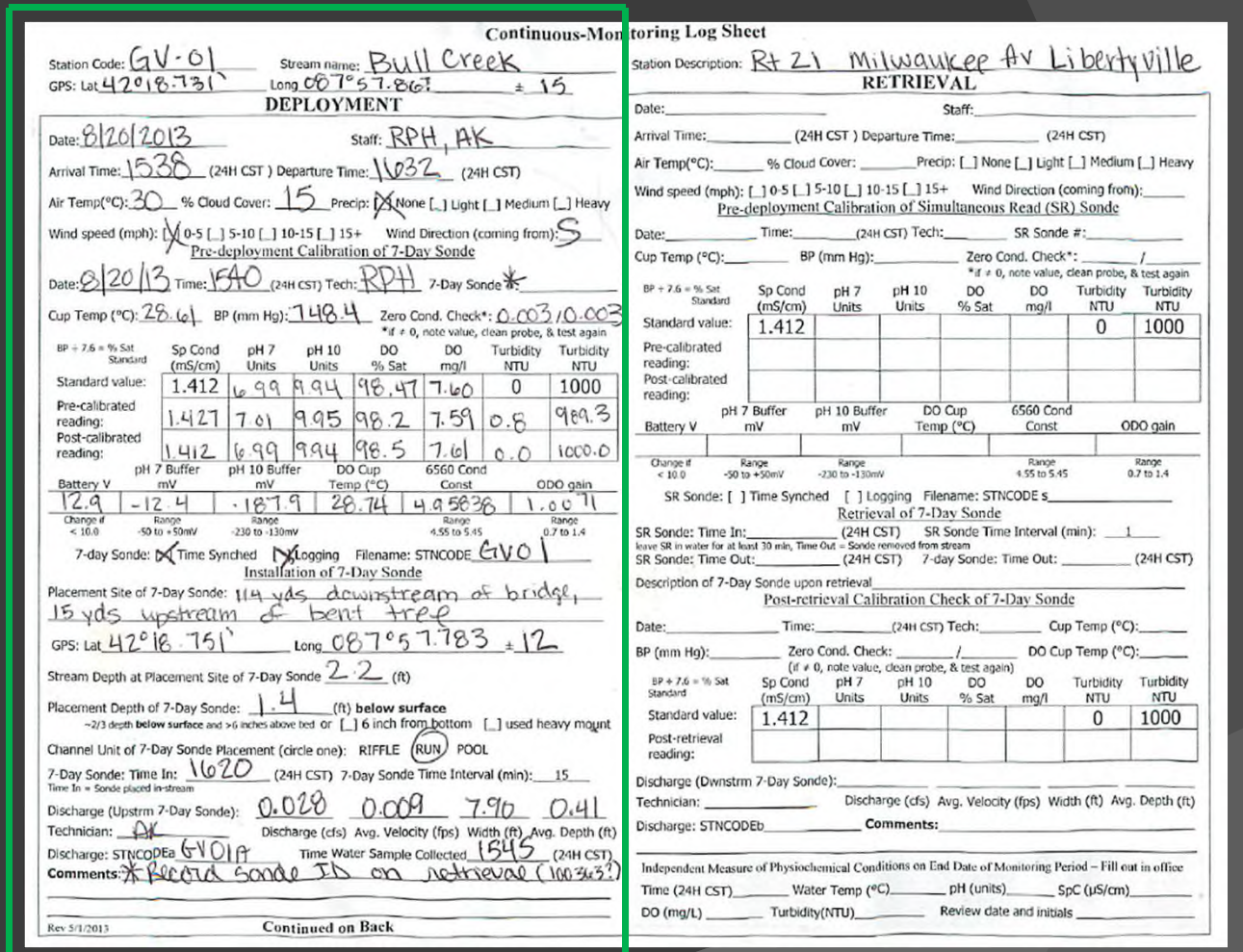
Data Failing QA/QC checks

	Temperature	Specific Conductance	pH	Dissolved Oxygen	Turbidity
2009	1%	25%	2%	39%	45%
2010	0%	30%	2%	27%	78%
2011	0%	14%	4%	27%	88%
2012	0%	13%	2%	12%	58%
2013	0%	11%	6%	3%	55%


Site Visits
Site Conditions
Distance to Water – Be sure to include length of tape weight
Place spot meter
Begin sampling –
If wading, always approach from downstream
Record spot meter values
Use Low Flow DO Monitoring Site Log

Collected Data & Information

- Deployment
  - Site log (started)
  - Calibration information
  - Discharge measurement
  - Water quality sample collected



Continuous-Monitoring Log Sheet

Station Code: GV-01 Stream name: Bull Creek
GPS: Lat 42°18.731' Long 087°57.867' ± 15

DEPLOYMENT

Date: 8/20/2013 Staff: RPH, AK
Arrival Time: 1538 (24H CST) Departure Time: 1632 (24H CST)
Air Temp(°C): 30 % Cloud Cover: 15 Precip: [X] None [ ] Light [ ] Medium [ ] Heavy
Wind speed (mph): [X] 0-5 [ ] 5-10 [ ] 10-15 [ ] 15+ Wind Direction (coming from): S

Pre-deployment Calibration of 7-Day Sonde

Date: 8/20/13 Time: 1540 (24H CST) Tech: RPH 7-Day Sonde #: *
Cup Temp (°C): 28.6 BP (mm Hg): 748.4 Zero Cond. Check*: 0.003/0.003
*if ≠ 0, note value, clean probe, & test again

BP ÷ 7.6 = % Sat Standard	Sp Cond (mS/cm)	pH 7 Units	pH 10 Units	DO % Sat	DO mg/l	Turbidity NTU	Turbidity NTU
Standard value:	1.412	6.99	9.94	98.47	7.60	0	1000
Pre-calibrated reading:	1.427	7.01	9.95	98.2	7.59	0.8	989.3
Post-calibrated reading:	1.412	6.99	9.94	98.5	7.61	0.0	1000.0

Battery V	pH 7 Buffer mV	pH 10 Buffer mV	DO Cup Temp (°C)	6560 Cond Const	ODO gain
12.9	-12.4	-187.9	28.74	4.95838	1.0071
Change if < 10.0	Range -50 to +50mV	Range -230 to -130mV		Range 4.55 to 5.45	Range 0.7 to 1.4

7-day Sonde: [X] Time Synched [X] Logging Filename: STNCODE GV01

Installation of 7-Day Sonde

Placement Site of 7-Day Sonde: 114 yds downstream of bridge, 15 yds upstream of bent tree
GPS: Lat 42°18.751' Long 087°57.783 ± 12
Stream Depth at Placement Site of 7-Day Sonde 2.2 (ft)
Placement Depth of 7-Day Sonde: 1.4 (ft) **below surface**
~2/3 depth **below surface** and >6 inches above bed or [ ] 6 inch from bottom [ ] used heavy mount
Channel Unit of 7-Day Sonde Placement (circle one): RIFFLE (RUN) POOL
7-Day Sonde: Time In: 1620 (24H CST) 7-Day Sonde Time Interval (min): 15
Time In = Sonde placed in-stream

Discharge (Upstrm 7-Day Sonde):	0.028	0.009	7.90	0.41
Technician: AK	Discharge (cfs)	Avg. Velocity (fps)	Width (ft)	Avg. Depth (ft)

Discharge: STNCODEa GV01A Time Water Sample Collected 1545 (24H CST)
Comments: * Record Sonde ID on retrieval (100363?)

Rev 5/1/2013 **Continued on Back**

Station Description: Rt 21 Milwaukee Av Libertyville

RETRIEVAL

Date: Staff:
Arrival Time: (24H CST) Departure Time: (24H CST)
Air Temp(°C): % Cloud Cover: Precip: [ ] None [ ] Light [ ] Medium [ ] Heavy
Wind speed (mph): [ ] 0-5 [ ] 5-10 [ ] 10-15 [ ] 15+ Wind Direction (coming from):

Pre-deployment Calibration of Simultaneous Read (SR) Sonde

Date: Time: (24H CST) Tech: SR Sonde #:
Cup Temp (°C): BP (mm Hg): Zero Cond. Check*: /
*if ≠ 0, note value, clean probe, & test again

BP ÷ 7.6 = % Sat Standard	Sp Cond (mS/cm)	pH 7 Units	pH 10 Units	DO % Sat	DO mg/l	Turbidity NTU	Turbidity NTU
Standard value:	1.412					0	1000
Pre-calibrated reading:							
Post-calibrated reading:							

Battery V	pH 7 Buffer mV	pH 10 Buffer mV	DO Cup Temp (°C)	6560 Cond Const	ODO gain
Change if < 10.0	Range -50 to +50mV	Range -230 to -130mV		Range 4.55 to 5.45	Range 0.7 to 1.4

SR Sonde: [ ] Time Synched [ ] Logging Filename: STNCODE s

Retrieval of 7-Day Sonde

SR Sonde: Time In: (24H CST) SR Sonde Time Interval (min): 1
leave SR in water for at least 30 min, Time Out = Sonde removed from stream
SR Sonde: Time Out: (24H CST) 7-day Sonde: Time Out: (24H CST)
Description of 7-Day Sonde upon retrieval

Post-retrieval Calibration Check of 7-Day Sonde

Date: Time: (24H CST) Tech: Cup Temp (°C):
BP (mm Hg): Zero Cond. Check: / DO Cup Temp (°C):
(if ≠ 0, note value, clean probe, & test again)

BP ÷ 7.6 = % Sat Standard	Sp Cond (mS/cm)	pH 7 Units	pH 10 Units	DO % Sat	DO mg/l	Turbidity NTU	Turbidity NTU
Standard value:	1.412					0	1000
Post-retrieval reading:							

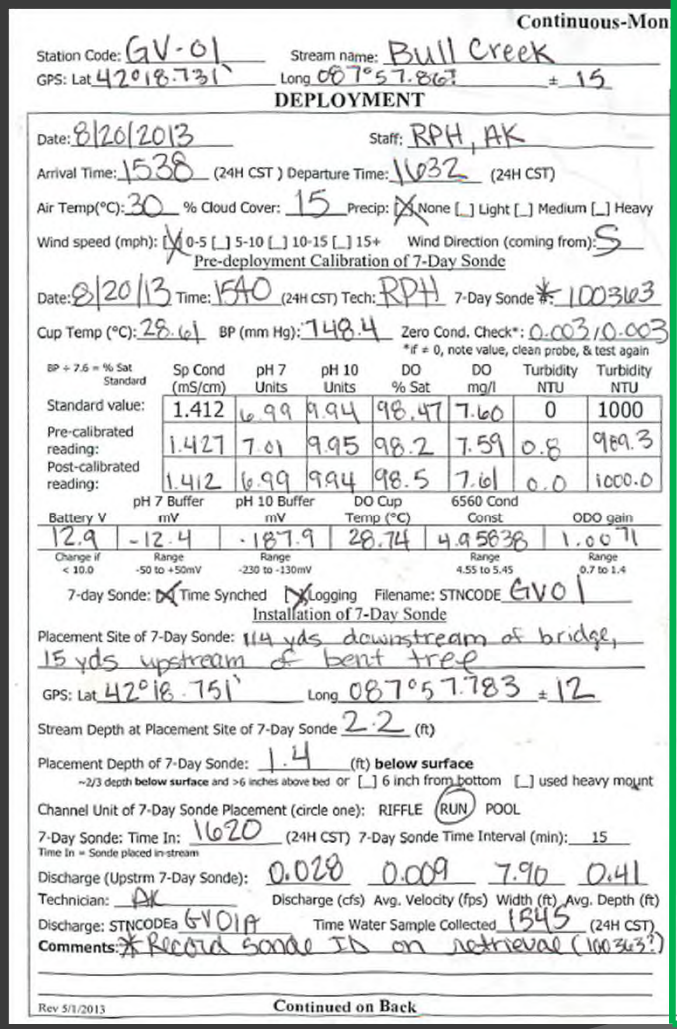
Discharge (Dwnstrm 7-Day Sonde):				
Technician:	Discharge (cfs)	Avg. Velocity (fps)	Width (ft)	Avg. Depth (ft)

Discharge: STNCODEb **Comments:**

Independent Measure of Physiochemical Conditions on End Date of Monitoring Period – Fill out in office
Time (24H CST) Water Temp (°C) pH (units) SpC (µS/cm)
DO (mg/L) Turbidity(NTU) Review date and initials

Collected Data & Information

- Retrieval
  - Discharge measurement
  - Sonde data
  - Simultaneous Read (SR) sonde data
  - Site log (completed)



Continuous-Monitoring Log Sheet

Station Code: GV-01 Stream name: Bull Creek
GPS: Lat 42°18.731' Long 087°57.867' ± 15

DEPLOYMENT

Date: 8/20/2013 Staff: RPH, AK
Arrival Time: 1538 (24H CST) Departure Time: 1632 (24H CST)
Air Temp(°C): 30 % Cloud Cover: 15 Precip: [X] None [ ] Light [ ] Medium [ ] Heavy
Wind speed (mph): [X] 0-5 [ ] 5-10 [ ] 10-15 [ ] 15+ Wind Direction (coming from): S

Pre-deployment Calibration of 7-Day Sonde

Date: 8/20/13 Time: 1540 (24H CST) Tech: RPH 7-Day Sonde #: 100363
Cup Temp (°C): 28.61 BP (mm Hg): 748.4 Zero Cond. Check*: 0.003 / 0.003
*if ≠ 0, note value, clean probe, & test again

BP ÷ 7.6 = % Sat Standard	Sp Cond (mS/cm)	pH 7 Units	pH 10 Units	DO % Sat	DO mg/l	Turbidity NTU	Turbidity NTU
Standard value:	1.412	6.99	9.94	98.47	7.60	0	1000
Pre-calibrated reading:	1.427	7.01	9.95	98.2	7.59	0.8	989.3
Post-calibrated reading:	1.412	6.99	9.94	98.5	7.61	0.0	1000.0

Battery V	pH 7 Buffer mV	pH 10 Buffer mV	DO Cup Temp (°C)	6560 Cond Const	ODO gain
12.9	-12.4	-187.9	28.74	4.95838	1.0071
Change if < 10.0	Range -50 to +50mV	Range -230 to -130mV		Range 4.55 to 5.45	Range 0.7 to 1.4

7-day Sonde: [X] Time Synched [X] Logging Filename: STNCODE GV01

Installation of 7-Day Sonde

Placement Site of 7-Day Sonde: 114 yds downstream of bridge, 15 yds upstream of bent tree
GPS: Lat 42°18.751' Long 087°57.783' ± 12
Stream Depth at Placement Site of 7-Day Sonde 2.2 (ft)
Placement Depth of 7-Day Sonde: 1.4 (ft) **below surface**
~2/3 depth **below surface** and >6 inches above bed or [ ] 6 inch from bottom [ ] used heavy mount
Channel Unit of 7-Day Sonde Placement (circle one): RIFFLE (RUN) POOL
7-Day Sonde: Time In: 1620 (24H CST) 7-Day Sonde Time Interval (min): 15
Time In = Sonde placed in-stream

	Discharge (cfs)	Avg. Velocity (fps)	Width (ft)	Avg. Depth (ft)
Discharge (Upstrm 7-Day Sonde):	0.028	0.009	7.90	0.41

Technician: AK
Discharge: STNCODEa GV01A Time Water Sample Collected 1545 (24H CST)
Comments: * Record Sonde ID on retrieval (100363?)

Rev 5/1/2013 Continued on Back

Station Description: Rt 21 Milwaukee Av Libertyville

RETRIEVAL

Date: 8/28/13 Staff: RPH, AK
Arrival Time: 1501 (24H CST) Departure Time: 1546 (24H CST)
Air Temp(°C): 29 % Cloud Cover: 10 Precip: [X] None [ ] Light [ ] Medium [ ] Heavy
Wind speed (mph): [ ] 0-5 [X] 5-10 [ ] 10-15 [ ] 15+ Wind Direction (coming from): NE

Pre-deployment Calibration of Simultaneous Read (SR) Sonde

Date: 8/28/13 Time: 0740 (24H CST) Tech: AK SR Sonde #: 100462
Cup Temp (°C): 27.79 BP (mm Hg): 744.0 Zero Cond. Check*: 0.002 / 0.002
*if ≠ 0, note value, clean probe, & test again

BP ÷ 7.6 = % Sat Standard	Sp Cond (mS/cm)	pH 7 Units	pH 10 Units	DO % Sat	DO mg/l	Turbidity NTU	Turbidity NTU
Standard value:	1.412	6.99	9.94	97.89	7.88	0	1000
Pre-calibrated reading:	1.416	7.02	9.91	99.2	7.99	-0.3	992.2
Post-calibrated reading:	1.412	6.99	9.94	97.9	7.89	0.0	1000.0

Battery V	pH 7 Buffer mV	pH 10 Buffer mV	DO Cup Temp (°C)	6560 Cond Const	ODO gain
12.1	-23.2	-196.7	26.39	4.99128	1.04488
Change if < 10.0	Range -50 to +50mV	Range -230 to -130mV		Range 4.55 to 5.45	Range 0.7 to 1.4

SR Sonde: [X] Time Synched [X] Logging Filename: STNCODE s GV01S

Retrieval of 7-Day Sonde

SR Sonde: Time In: 1508 (24H CST) SR Sonde Time Interval (min): 1
leave SR in water for at least 30 min. Time Out = Sonde removed from stream
SR Sonde: Time Out: 1538 (24H CST) 7-day Sonde: Time Out: 1538 (24H CST)
Description of 7-Day Sonde upon retrieval moderate fouling

Post-retrieval Calibration Check of 7-Day Sonde

Date: 8/28/13 Time: 1614 (24H CST) Tech: AK Cup Temp (°C): 27.40
BP (mm Hg): 746.7 Zero Cond. Check: 0.001 / 0.001 DO Cup Temp (°C): 26.92
(if ≠ 0, note value, clean probe, & test again)

BP ÷ 7.6 = % Sat Standard	Sp Cond (mS/cm)	pH 7 Units	pH 10 Units	DO % Sat	DO mg/l	Turbidity NTU	Turbidity NTU
Standard value:	1.412	7.0	10.0	98.25	7.84	0	1000
Post-retrieval reading:	1.406	7.02	9.98	98.4	7.75	-0.8	996.0

	Discharge (cfs)	Avg. Velocity (fps)	Width (ft)	Avg. Depth (ft)
Discharge (Dwnstrm 7-Day Sonde):	0			

Technician: RPH
Discharge: STNCODEb Comments: PZF no flow between pools, construction also blocked water flow

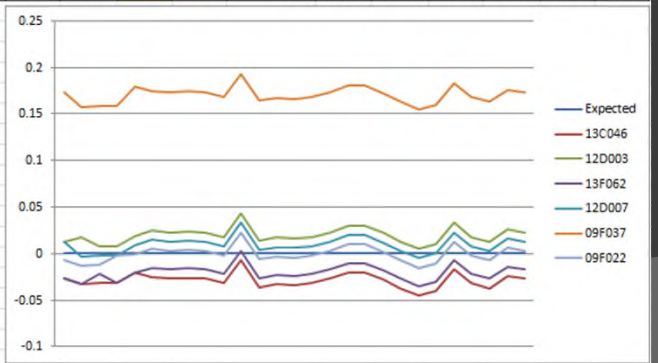
Independent Measure of Physiochemical Conditions on End Date of Monitoring Period – Fill out in office
Time (24H CST) Water Temp (°C) pH (units) SpC (µS/cm)
DO (mg/L) Turbidity(NTU) Review date and initials

QA/QC efforts

- All sondes/probes have scheduled calibration or validation checks prior to and immediately following the field season and biweekly during field season.

			Observed						Water Bath	Actual Sonde Temp					
Date	Time	Expected	13C046	12D003	13F062	12D007	09F037	09F022	Thermometer	13C046	12D003	13F062	12D007	09F037	09F022
4/3/2014	9:18	0	-0.03	0.02	-0.02	0.01	0.17	0.00	20.05	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:19	0	-0.02	0.03	-0.01	0.02	0.18	0.01	20.06	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:20	0	-0.02	0.03	-0.01	0.02	0.18	0.01	20.06	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:21	0	-0.03	0.02	-0.02	0.01	0.17	0.00	20.05	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:22	0	-0.04	0.01	-0.03	0.00	0.16	-0.01	20.04	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:23	0	-0.04	0.00	-0.04	0.00	0.16	-0.02	20.04	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:24	0	-0.04	0.01	-0.03	0.00	0.16	-0.01	20.04	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:25	0	-0.02	0.03	-0.01	0.02	0.18	0.01	20.06	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:26	0	-0.03	0.02	-0.02	0.01	0.17	0.00	20.05	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:27	0	-0.04	0.01	-0.03	0.00	0.16	-0.01	20.04	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:28	0	-0.02	0.03	-0.01	0.02	0.18	0.01	20.06	20.08	20.03	20.07	20.04	19.88	20.05
4/3/2014	9:29	0	-0.03	0.02	-0.02	0.01	0.17	0.00	20.05	20.08	20.03	20.07	20.04	19.88	20.05
	Average		-0.03	0.02	-0.02	0.01	0.17	0.00	20.05	20.08	20.04	20.08	20.05	19.88	20.06

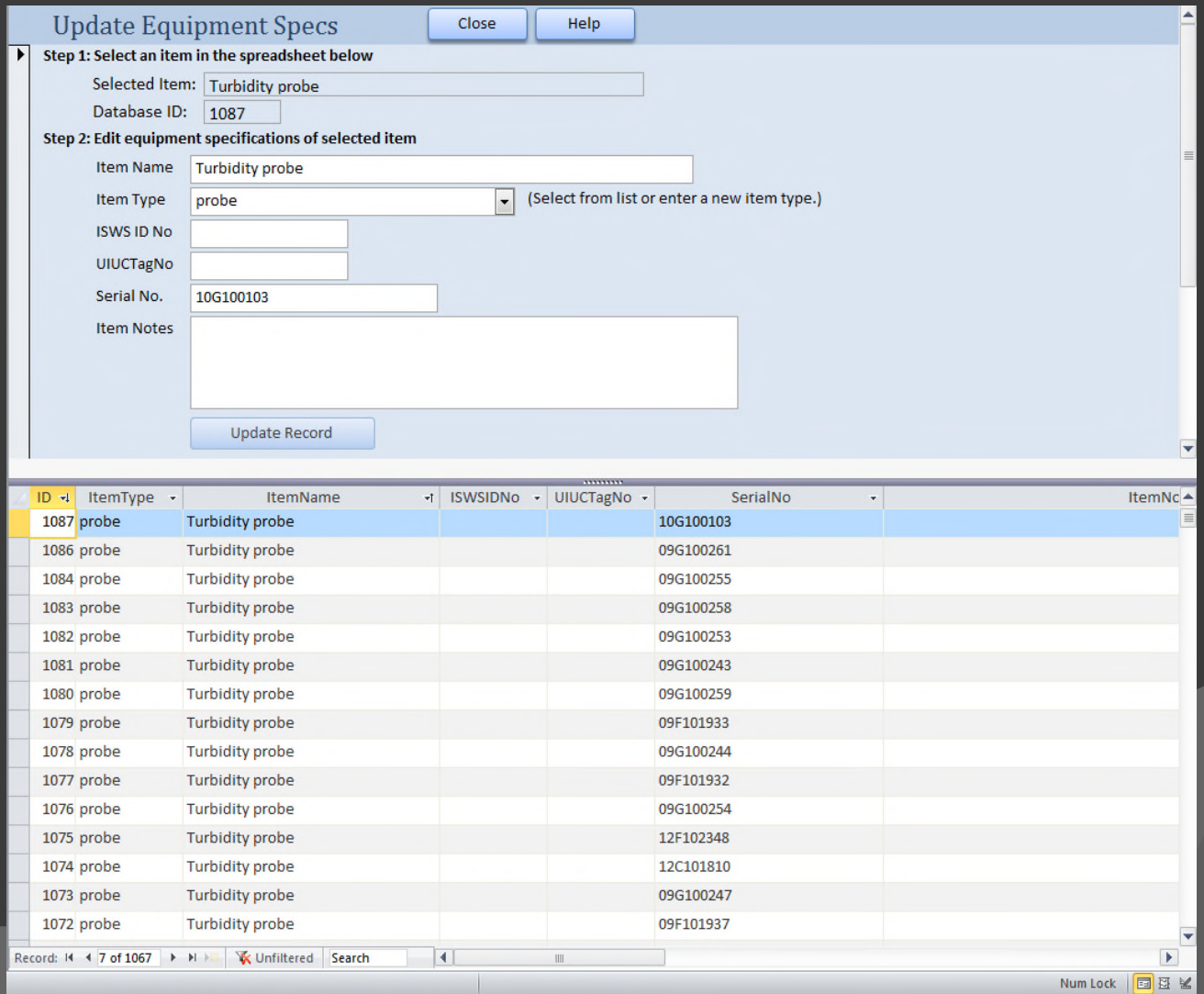
0.15	outside of probe accuracy of 0.15
<0.15	within probe accuracy



- All calibration values including all internal probe constants and cell values are tracked in order to identify probes nearing failure.

Serial #	Site	Deployment	Date	Time	Tech	BP (mm Hg)	Battery V	-50/+50 pH 7 Buffer mV	-230/-130 pH 10 Buffer mV	do Cup Ter	165/180 pH mv diff	4.55/5.45 6560 Cond Const	0.7/1.4 ODO gain
101640	GL-17	7-day	6/24/2013	14:03	ATG	747.2	10.0	-22.4	-199.3	32.11	176.9	5.11986	1.11511
101127	G-46	7-day	6/24/2013	19:05	ATG	746.9	10.5	-14.5	-191.2	30.94	176.7	4.88919	1.0286
100348	N-06	SR	6/25/2013	19:00	AKP	743.1	10.1	-25.8	-195.5	30.50	169.7	4.73387	1.04833
101381	G-08	7-day	6/25/2013	8:52	RPH	741.8	13.0	-23.6	-200.5	22.71	176.9	5.02021	1.04455
101380	GWA-01	7-day	6/25/2013	10:21	RPH	738.7	11.5	-13.9	-172	25.19	158.1	5.03673	1.03675
100363	GW-04	7-day	6/25/2013	13:00	RPH	740.0	11.9	-10.4	-187.9	29.04	177.5	4.97829	1.01371
101125	GU-06	7-day	6/25/2013	6:57	AK	741.7	10.4	-28.9	-208.3	24.33	179.4	4.90822	1.02445
100461	G-35	7-day	6/25/2013	9:04	AK	741.7	12.0	-24.6	-203.3	24.20	178.7	4.8783	1.04898
46772	GV-01	7-day	6/25/2013	11:51	AK	744.6	11.7	-16.4	-192.6	27.37	176.2	5.18034	1.0391
46803	G-07	7-day	6/25/2013	13:19	AK	744.0	11.6	-23.8	-197.4	27.27	173.6	4.95449	1.01858
101128	G-25	7-day	6/25/2013	15:00	AK	742.7	11.9	-25.2	-202.4	28.89	177.2	5.09859	1.06440
101382	G-01	7-day	6/25/2013	5:04	RPH	743.2	13.1	-25.4	-202.5	23.19	177.1	5.02502	1.00386
101383	G-12	7-day	6/25/2013	5:26	RPH	743.3	11.9	-26.9	-196.6	23.78	169.7	5.00557	1.06323
100464	EID-01	7-day	6/26/2013	6:11	RPH	742.6	11.4	-23.2	-200.4	24.69	177.2	5.01973	1.03878
100361	E-25	7-day	6/26/2013	9:41	DMS	744.3	11.7	-21.8	-199.1	23.95	177.3	5.00781	1.03871

- Complete equipment histories are kept for all sondes/probe purchases, maintenance and repairs



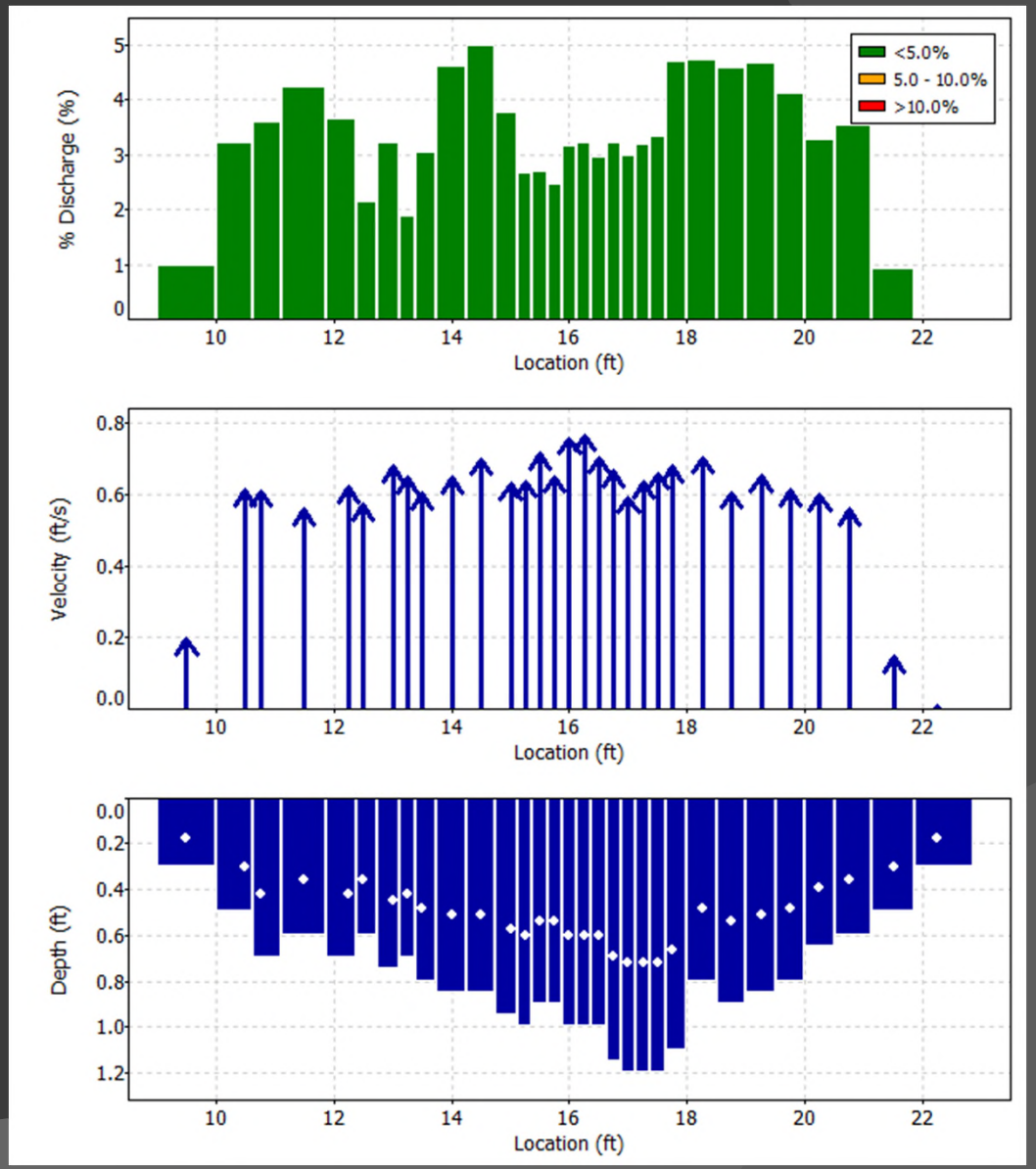
Data Management

- The completeness and thoroughness of the data management practices employed will have a direct impact on data quality
- Data management practices offer perhaps the least expensive way to improve efficiencies and cost effectiveness

Data Review and Reduction

At the end of each week :

- All site logs and Q files are reviewed for completeness.
- All calibration values and probe specs are reviewed and probes nearing specs are replaced.



Data Review and Reduction

After the field season:

- Information from site logs are reviewed, scanned and entered. Sonde data graphed and reviewed, in/out and SR times determined.
- Total error, calibration drift determined and qualifiers assigned
- Once all data are finalized a 20% spot check is performed by an independent staff member

Acknowledgements

- Funded by IEPA, Gregg Good project manager
- Bill Ettinger, Manager, Central Monitoring Unit
- ISWS staff: Rachel Higgins, Amy Russell, Kip Stevenson, Jennifer Hill, Amy Krzton-Presson.
- JP Swigart.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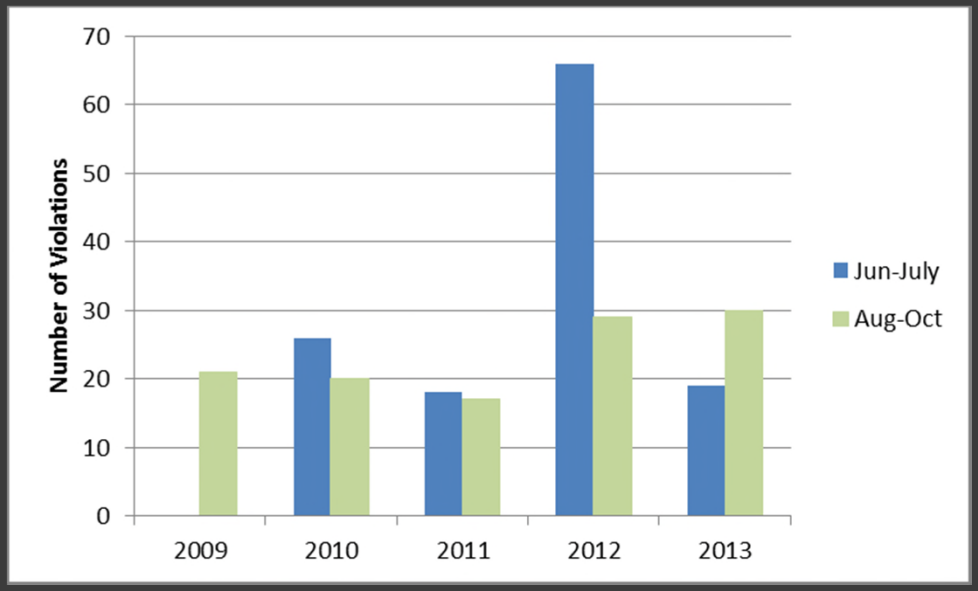

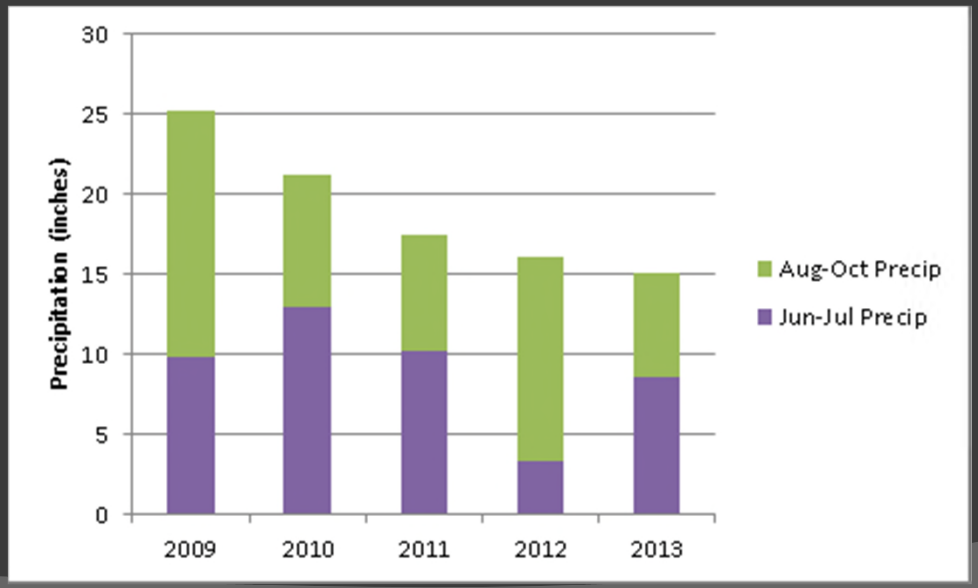

DO Violations

- During the period Mar-Jul
  - Less than 5.0 mg/L at any time
- During the period Aug-Feb
  - Less than 3.5 mg/L at any time

- Jun-Oct Precipitation
  - 30-year average = 17.9 inches
  - 2009 = 25.2 inches
  - 2013 = 15.1 inches

DO Violations by Monitoring Unit